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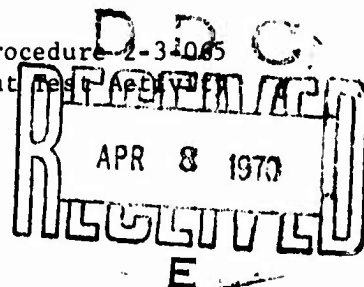
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23 May 1969

Materiel Test Procedure 2-34065  
General Equipment Test Agency

U. S. ARMY TEST AND EVALUATION COMMAND  
COMMODITY SERVICE TEST PROCEDURE

SLEDS



1. OBJECTIVE

This document provides procedures to determine to what degree sleds perform the mission as described in Qualitative Materiel Requirements (QMR's), Small Development Requirements (SDR's), and Military Characteristics (MC's) and the suitability of sleds and their maintenance packages for use by the Army.

2. BACKGROUND

Sleds are required for the transport of cargo over flat and/or rolling, arctic or winter terrain. The terrain may be completely covered with snow or ice or it may contain intermittent patches of bare frozen turf or of loose sand and gravel with the rest consisting of snow and ice. In arctic and sub-arctic regions the terrain may be broken up by narrow fissures or trenches or it may consist of various types of frozen soil containing segregated ice, muskeg vegetation, or brush-heath logs with numerous shallow water patches. Under such conditions it may be necessary for the prime mover when used, to be either a tracked or amphibious vehicle.

Snow covering the terrain may be shallow or deep, new-fallen and soft, soft with a hard crust, packed and hard, or slushy. Muskeg vegetation is usually moist or wet. When the terrain is covered with ice or deep snow, a toboggan type sled may be the most suitable kind of sled to use.

Sleds may be vehicular or manually-towed types, each governed by different design considerations.

In the case of manually towed sleds the sled cargo weight may be as much as 100 pounds per man. The trail ahead of the sled may be narrow (one man towing) or wide (two man towing in tandem). Terrain cover may be shallow (towing personnel wearing skis or snow shoes) or deep (personnel wearing boots).

When the sled is towed by a vehicle the cargo weight could be one ton or more and two or more sleds could be hitched in series. Cargo weight may have to be reduced when a sled equipped with runners is towed over relatively soft terrain surfaces to prevent excessive sinking into the surface. Towed by a wheeled vehicle, the trail left by the wheels will be deeper than the trail left by a tracked vehicle of the same weight. Spacing of the sled runners must be considered also, since a sled equipped with runners which are spaced apart the same distance as vehicle wheels or tracks most probably will be less likely to overturn than one whose runners are spaced differently since the runners tend to ride in the vehicle tracks.

On rolling or hilly terrain, the sled may be towed either straight uphill or downhill, or it may be "side-hilled" where the towing is sideways to the terrain slope in either a straight or curved line.

AD 867071

MTP 2-3-065  
23 May 1969

The cargo-carrying section of the sled can be a flat-bed with staked vertical panel sides or it can be a scow-shaped, waterproof hull, suitable for amphibious operations. Depending on the nature of the terrain, runner-equipped sleds may be designed so that the cargo bed can be positioned close to, or high above, the runner surface.

The sled must be able to be easily loaded, its cargo secured, and unloaded in the coldest weather. The loaded sled should have a low center of gravity and should be designed to minimize the possibility of overturning or jackknifing when the towing vehicle hits an obstruction or backs up too fast. A protective cover for protection of the cargo from precipitation and high winds should be a feature of each sled.

3. REQUIRED EQUIPMENT

a. Suitable Test Sites, for conducting the applicable subtests in arctic and subarctic climates, including areas near:

- 1) Beach heads
- 2) Forward area temporary supply points or depots
- 3) Fixed supply installation or airfields

b. Towing Vehicles, as required

c. Draw-bar hitches, as required

d. Rope hitches, as required

e. Manual towing equipment, as required, including:

- 1) Single trace harnesses
- 2) Double trace harnesses

f. Maintenance Support Facilities

g. Measuring Tape

h. Weighing Scales

i. Thermometers

j. Anemometers

k. Camouflage Materials, as required

l. Preservative Materials

m. Packaging Materials, as required

n. Packing (shipment) Containers, as required

o. Marking Materials, as specified

p. Optical Instruments, as required

q. Photographic Equipment, including:

- 1) Still cameras
- 2) Flash bulbs
- 3) Color and black and white film
- 4) Photo processing facility
- 5) Aerial camera
- 6) Aerial photo analysis facility

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MTP 2-3-065

23 May 1969

*TS, Aberdeen Proving Ground, Md. 21005*

- s. Cleaning Materials, for removal of preservatives, if necessary
- t. Representative Cargo Payloads
- u. Special Footgear, as required
- v. Arctic Environmental Clothing
- w. Tools, for crating and uncrating
- x. Facilities and Equipment, as required by the referenced MTP's

4.

REFERENCES

- A. USATECOM Regulation, 385-6, Verification of Safety of Material During Testing.
- B. USATECOM Regulation 700-1, Value Engineering.
- C. USATECOM Regulation 705-4, Equipment Performance Report.
- D. USATECOM Regulation 750-15, Maintenance Portion of the Service Test.
- E. MIL-STD-129, Marking for Shipment and Storage.
- F. MIL-STD-130, Identification Marking of U. S. Military Property.
- G. MIL-STD-751, Stitches, Seams and Stitching.
- H. MIL-STD-814, Requirements for Tiedown Suspension and Provisions on Military Materiel for Air Drop.
- I. MIL-P-116, Preservation, Methods of.
- J. PPP-C-650, Crates, Wood, Open and Covered.
- K. MIL-STD-1186, Cushioning, Anchoring, Bracing, Blocking, and Waterproofing; with Appropriate Test Methods.
- L. TM-5-852-8, Terrain Evaluation in Arctic and Subarctic Regions.
- M. MTP 2-3-500, Preoperational Inspection and Physical Characteristics.
- N. MTP 2-3-501, Safety Hazards.
- O. MTP-2-3-508, Stowage.
- P. MTP 2-3-516, Human Factors Engineering.
- Q. MTP 2-3-518, Line Haul Operation.
- R. MTP 2-3-519, Surface Transportability (Vehicles).
- S. MTP 2-3-526, Cargo Loading Adaptability (CLA).
- T. MTP 7-1-002, Air Portability and Air Drop Service Testing.
- U. MTP 7-3-512, Air Drop Capability (Suitability of Equipment For).
- V. MTP 7-3-515, Air Transport, Internal (Suitability of Equipment For).
- W. MTP 7-3-516, Air Transport, External (Suitability of Equipment For).
- X. MTP 10-3-501, Operator Training and Familiarization.
- Y. MTP 10-3-504, Maintenance Evaluation.

5.

SCOPE

5.1

SUMMARY

This document describes the following procedures to be used in the evaluation of sleds:

- a. Preparation for Test - A determination of the as-received condition of the test item, measurement of the physical characteristics of the component parts, and the completely-assembled test item, and operator training and familiarization procedures.

b. Operation Performance, including:

- 1) Test Item Assembly - An evaluation of the ease of assembly of the test item.
- 2) Cargo Loading Adaptability - A study, if required, of the kinds of loads that the test item can accept.
- 3) Cargo Loading - A study to determine the suitability of the test item for accepting typical cargo loads.
- 4) Cargo Protection - An evaluation of the effectiveness of the test item protective cover in protecting the cargo and the item in high winds.
- 5) Vehicular Towing Tests - A study to determine the operational characteristics of vehicular towed test item when towed, singly or in sled trains over a variety of terrain surfaces.
- 6) Manual Towing Tests - A study to determine the operational characteristics of manually towed test items when towed over a variety of terrain surfaces.
- 7) Unloading - A study of the suitability of the test item for unloading of typical cargo loads.
- 8) Stowage - An evaluation of the test item stowage facilities.

c. Durability - An evaluation of the test item capability to withstand the rigors of the operational conditions.

d. Transportability - A study to determine the suitability of the test item to be packaged and shipped over land, sea, and air, and air dropped (by service personnel).

e. Camouflage Operations - A study to determine the susceptibility of the test item to be detected from ground and aerial positions while under camouflage.

f. Maintainability and Reliability Evaluation - That portion of the test which is concerned with the following: verification and appraisal of failures; determination and appraisal of maintenance characteristics and requirements; appraisal of design-for maintainability; appraisal of the maintenance test package; and, calculation of indicators which express the effects of the preceding aspects.

g. Human Factors Evaluation - An evaluation to assess the degree of ease, simplicity, and effort required in assembling, operating, maintaining and transporting the test item.

h. Safety - An evaluation to determine the test item compliance with safety requirements, and to confirm safety characteristics during operational use.

i. Value Analysis - An evaluation to determine any unnecessary, costly or nice-to-have item features which may be eliminated.

## 5.2 LIMITATIONS

These procedures are limited to sleds used on snow or ice-covered terrain, and/or on terrain covered with sand, gravel, narrow fissures or trenches, tundra, muskeg, peat, frozen soil containing segregated ice, brush-heath bogs or shallow waters.

## 6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Initial Inspection

6.1.1.1 Arrival Inspection

Upon receipt, subject the test item and test item packages to the applicable sections of MTP 2-3-500, and the following:

a. Visually inspect test item packaging and record:

- 1) Evidence of damage or deterioration
- 2) Identification marking including:

- a) Manufacturer
- b) Contract number and date
- c) Date of manufacture

- 3) Condition of item as to whether being unused, or used

b. Weigh and measure the test item package(s) and record the following for each shipping package:

- 1) Contents
- 2) Weight
- 3) Length, width, and height
- 4) Cubage

c. Unpack the test item and record the type and adequacy of packing material in the shipping container.

d. Record the extent of depreservation required.

e. Visually inspect the test item and record, whenever applicable, evidence of defects in:

- 1) Manufacturing
- 2) Materials
- 3) Workmanship
- 4) Test item which could endanger the safety of test personnel

f. Inspect the test item and verify that all markings are in accordance with MIL-STD-129. Record all discrepancies.

g. Record the presence of instruction plates, if applicable, including:

- 1) Identification
- 2) Caution
- 3) Service and handling

6.1.1.2 Inventory Check

a. Conduct an inventory against the basic item issue list (BIIL).

MTP 2-3-065  
23 May 1969

Record evidence of discrepancies in the inventory of: Maintenance instructions, repair parts, associated tools and associated equipment.

b. Prepare an Equipment Performance Report (EPR) when applicable for omissions or defects.

#### 6.1.1.3 Physical Characteristics

Determine the physical characteristics of the test item, in comparison with required characteristics, as described in the applicable sections of MTP 2-3-500, and the following as applicable:

NOTE: Do not repeat verified and acceptable data available from previous test phases.

- a. Weight
- b. Overall length
- c. Overall width
- d. Overall height
- e. Cubage
- f. Dimensions of the cargo space
- g. Dimensions of the runner surfaces
- h. Distances between the runners
- i. Location of towing harness or bar attachment point(s)

#### 6.1.2 Operator Training and Familiarization

a. Ensure the availability of service test personnel of proper MOS trained in the operation, maintenance, and safety aspects of the test item using the criteria of MTP 10-3-501 including the following:

- 1) Safety precautions and hazards involved in attaching test items to each other in series and/or to the towing vehicle.
- 2) Capabilities and limitations of the test item.
- 3) Instruction in the operation of the towing vehicle including:
  - a) Maneuvering
  - b) Rough terrain operation over obstacles, narrow trenches or fissures, ice, snow, tundra, muskeg, peat, frozen soil, brush heath bogs, and through shallow waters, including turning while "side-hilling".
  - c) Backing, "down-hilling", and turning so as to avoid "jackknifing".
  - d) Side pulling to break frozen test item runners/or sliding surfaces loose.
- 4) Instruction in the hazards associated with the overall testing environment.
- 5) Instruction in the use of environmental clothing and equipment.
- 6) Instruction in preparing the test item for shipment.



b. Ensure the availability of all technical literature pertaining to the test item and assess and record the adequacy of these documents for instructional purposes.

c. Ensure that experienced personnel are available for the duration of testing.

#### 6.1.3 Facilities and Equipment

a. Select and schedule the use of testing sites and facilities as required by the applicable subtests and the referenced MTP's.

b. Upon notice of the arrival (or estimated time of arrival) of the test item, arrange for/or secure the following:

- 1) Engineering safety release for the test item from the engineering agency as described by reference 4A.
- 2) Vehicles required for transporting and for towing the test item, as applicable.
- 3) Maintenance support facilities, organization and personnel.
- 4) Testing areas which contain the types of terrain which surround the following types of installations:
  - a) Beach Head
  - b) Forward area temporary supply points or depots
  - c) Fixed supply installations or airfields
- 5) Testing areas which will experience arctic or subarctic conditions during the period of testing.
- 6) The assistance of the appropriate test activity in the conduct of airborne operations.
- 7) Adequate amounts of protective clothing and equipment for the duration of testing.

c. Prepare a log to record, daily, all terrain and environmental conditions encountered, all maneuvers conducted, all repairs made, accumulated mileage, duration of testing and test results.

#### 6.2 TEST CONDUCT

NOTE: All test item failures or discrepancies shall be reported in accordance with USATECOM Regulation 705-4.

##### 6.2.1 Operational Performance

Determine the operational performance of the test item using the following criteria:

a. Sleds, and prime movers (human or vehicle), undergoing service tests shall be subjected to realistic environments and shall be utilized to perform tasks within the mission requirements of the various TOE units which normally use sleds for hauling cargo.

b. Proper MOS-qualified vehicle operators, towing personnel (when

MTP 2-3-065  
23 May 1969

required) and maintenance and packaging personnel, as required, shall be used for all tests.

c. The test item shall be exposed at all times to weather and terrain which are representative of actual service conditions. Any deficiency, short-coming or unusual occurrence shall be reported on AMSTE Form 1025 in accordance with USATECOM Regulation 705-4.

d. The performance evaluation shall be continued until sufficient testing time has been accomplished to be representative of the specific test item mission requirements and until enough data have been collected to predict with confidence the value of the test item relative to reliability, maintainability and mission performance.

e. Performance evaluation criteria shall be according to the QMR, SDR, and MC with the following considerations:

- 1) When the test item is of the type that is towed by a powered vehicle, the towing vehicle shall be typical of the class of vehicles represented and shall be in excellent operating condition, to the extent that it will not interfere with the performance evaluation of the test item. Additionally, the performance capabilities of the prime mover, without the towed sled, and under similar terrain and environmental conditions, shall be known in order to evaluate the effect of the sled on the performance of the towing vehicle. Wheeled or tracked vehicles shall be used depending on the characteristics of the terrain being traversed.
- 2) Observe the following precautions when using a vehicle to tow the test item(s):
  - a) Do not allow the test item(s) to push forward against the vehicle when descending steep grades, backing up or turning. (Failure to observe this precaution could cause the vehicle-test item combination to jackknife.)
  - b) Comply with the turning, backing, stopping and "side-hilling" operational procedures as described in the applicable technical literature. Comment if such procedures are not adequately stated.
- 3) Observe the following procedures when the test item is manually towed:
  - a) Use service personnel of average height, weight and strength and who have experience in traversing arctic terrains while wearing skis, snowshoes, ski boots or other type of arctic footwear.
  - b) The number of personnel used and the type of footwear worn shall be appropriate for the load weight and the type of terrain being traversed.
  - c) The towing harnesses shall be designed so as to fit the towing personnel properly.

f. Unless otherwise specified, the test items shall be towed over

terrain which surrounds the installations of paragraph 6.1.1.2.b.4.

g. The extent of each performance test will be commensurate with the operational mileage required to assess the durability, reliability, and mission effectiveness requirements. Unless otherwise specified the total mileage accumulated shall not be less than that shown in the following table:

TOTAL ACCUMULATED MILEAGE

Type of Towing	Main or Secondary Roads	Cross-Country
Manual	-	20
Vehicular	50	200

h. The road courses, when specified, shall consist of left and right hand curves, straights, and uphill and downhill grades.

i. The cross-country course when specified, shall contain the same features as the road courses and, additionally, it shall include left and right hand side slopes and various obstacles, as required.

j. When the terrain over which the test item is towed has a deep soft surface, such as light snow, wet tundra, or muskeg, each test item or test item train shall be towed over a virgin surface, so that each item is subjected to the same type of surface conditions.

k. Subtests shall be conducted concurrently, wherever possible, to save time in the acquisition of data.

l. When a "standard" sled train is used as a comparison for the test item, it shall be typical of the class it represents, and shall be subjected to the same procedures and conditions and shall carry the same kind and weight of cargo as the test item.

6.2.1.1 Test Item Assembly

Perform the following for each test item as applicable:

a. Assemble a minimum of four test items as described in the applicable technical literature.

b. Record the following:

- 1) Number of personnel required to assemble the test item
- 2) Time required to assemble the test item
- 3) Difficulties encountered in assembling the test item
- 4) Adequacy of assembly instructions

6.2.1.2 Cargo Loading Adaptability

NOTE: Perform this subtest if the test item cargo loading adaptability has not been previously determined.

Determine the cargo loading adaptability of the test item as described in the applicable sections of MTP 2-3-526.

6.2.1.3 Cargo Loading

MTP 2-3-065  
23 May 1969

Perform the following for each test run:

a. Load the test item to its designated capacity with various types of supplies and equipment representative of typical loads which the test item is designed to carry.

- NOTE: 1. The heaviest cargo should be placed at the bottom of the test item in order to keep the center of gravity as low as possible.
2. When the test item is to be towed through still shallow water, the cargo weight shall be limited to the weight which the test item is required to carry under such towing conditions.

b. Secure the cargo and fasten the protective cover over the cargo using fastening and securing means provided.

c. Record the following for each test item loaded:

- 1) Number of personnel required for loading
- 2) Time required to load the test item
- 3) Material handling equipment used, as applicable
- 4) Weight of cargo loaded
- 5) Adequacy of cargo space
- 6) Adequacy of securing devices
- 7) Ease of loading and securing cargo
- 8) Difficulties encountered
- 9) Damage to test item or cargo caused by loading

#### 6.2.1.4 Cargo Protection

a. Expose a minimum of four full-loaded test items, with a variety of cargoes, under protective covers to high winds (20-40 mph) for a minimum of two hours.

NOTE: Orientation of the test items with respect to the wind direction shall be at random.

b. Record the following for each test item at the completion of the exposure period:

- 1) Duration of exposure
- 2) Average wind speed
- 3) Damage to protective cover
- 4) Damage to cargo
- 5) Cargo identity

c. Photograph any evidence of damage to illustrate the degree of protection afforded.

#### 6.2.1.5 Vehicular Towing Tests

6.2.1.5.1 Single Sled with Drawbar Hitch - Perform the following:

a. Load a minimum of four test items to full capacity each with a different load as specified in the test plan.

b. Attach a test item to the appropriate towing vehicle using a drawbar hitch and then record the following:

- 1) Number of personnel required to attach the test item to the vehicle.
- 2) Time required for the coupling operation.
- 3) Difficulties encountered in coupling operations.

c. Tow one test item, for the mileage specified in the test plan, at speeds consistent with terrain conditions, vehicle capabilities and safety, over a test course consisting of main or secondary roads and cross-country terrain, as specified in paragraph 6.2.1, and which is covered by soft, deep, snow.

d. During the towing operation back the vehicle-test item combination at least 10 yards on each portion of the highway or cross-country surface, specified in steps g and h of paragraph 6.2.1, and perform emergency stops on each portion.

e. Record the following for each test item during the course of towing operations, as applicable:

- 1) Cargo identity.
- 2) Cargo weight.
- 3) Cargo cubage.
- 4) Damage to cargo.
- 5) Turning and tracking ability.
- 6) Ability to ride over vertical obstacles.
- 7) Backing ability.
- 8) Side-slipping or swerving.
- 9) Excessive rocking/rolling.
- 10) Submersion of leading edge of sliding surface or prow.
- 11) Overturning tendency.
- 12) Whipping tendency.
- 13) Jackknifing tendency.
- 14) Leaks, wear, or punctures of the cargo hull or body.
- 15) Wear or fractures of runners.
- 16) Tendency of the test item to draw towards or into the towing vehicle track.
- 17) Minimum turning radius.
- 18) Damage to test item.
- 19) Degradation of towing vehicle performance due to the test item.

NOTE: If poor performance is obtained during any portion of the towing operation, repeat that portion and reduce the towing speeds until satisfactory performance is obtained. Record the highest speed for which satisfactory performance is obtained.

MTP 2-3-065  
23 May 1969

20) Maximum safe or practical towing speeds on:

- a) Roads
- b) Cross-country terrain

21) Number of right and left hand turns negotiated.

22) Number and grades of ascending and descending slopes.

23) Number and grades of side slopes.

24) Accumulated mileage over:

- a) Roads
- b) Cross-country terrain

25) Duration of testing

f. Record the following during each towing test:

- 1) Ambient temperature range
- 2) Wind conditions

g. Repeat the procedures of steps b through f for the remaining loaded test items.

h. Repeat the procedures of steps b through g for the following terrain surface conditions:

- 1) Hard or crusted ice and snow
- 2) Muskeg (on cross-country terrain)
- 3) Frozen soil with segregated ice
- 4) Heavy wet snow

6.2.1.5.2 Three-Sled Train with Drawbar Hitch - Perform the following:

a. Load a minimum of two three-sled trains to full capacity, each with a different load, as specified in the test plan.

b. Subject the sled trains to the towing procedures as described in paragraph 6.2.1.5.1.

6.2.1.5.3 Single Sled with Rope Hitch - Perform the following:

a. Load a minimum of four test items to full capacity, each with a different load, as specified in the test plan.

b. Subject the test items to the applicable towing procedures of paragraph 6.2.1.5.1.

NOTE: Backing and emergency stopping tests shall be excluded when a rope hitch is used to attach the test item to the towing vehicle.

6.2.1.6 Manual Towing Tests

NOTE: 1. Footwear for towing personnel shall be selected as

appropriate for the type of terrain cover. When the terrain is covered with soft, deep snow, ski boots for towing personnel are impractical, while skis provide poor traction on wet snow.

2. Except for especially difficult terrain conditions, one man can tow a sled with 100 pounds of cargo, provided the unloaded sled weight is not excessive. When there is doubt about the ease of towing a sled, two or more men shall be employed to tow the sled in tandem, using a multiple-trace towing harness.

a. Load a minimum of four test items, each with a different load, as specified in the test plan.

b. Attach the appropriate towing harness to each of the test items and record the following:

- 1) Number of personnel required to attach the harness to the test item.
- 2) Time required to attach the harness to the test item.
- 3) Difficulties encountered.

c. Towing personnel shall don the towing harness and record the following:

- 1) Ease of donning the harness.
- 2) Adjustments required for proper fit.
- 3) Time required to don the harness and make the adjustments.
- 4) Comments regarding the comfort of the harness and its fit with respect to protective clothing.

d. Tow the test item over a test course consisting of roads and cross-country terrain, as specified in paragraph 6.2.1, and which is covered by soft, deep snow.

e. Record the following for each test item during the course of towing operations, as applicable:

- 1) Turning and tracing ability
- 2) Ability to ride over vertical obstacles
- 3) Side slipping or swerving
- 4) Excessive rocking/rolling
- 5) Submersion of leading edge of sliding surface or prow
- 6) Overturning tendency
- 7) Leaks or punctures of the cargo hull or body
- 8) Wear or fractures of runners
- 9) Damage to test item
- 10) Damage to cargo
- 11) Cargo identity
- 12) Cargo weight
- 13) Any difficulty encountered during towing
- 14) Number of right and left hand turns negotiated
- 15) Number and grades of ascending and descending slopes

MTP 2-3-065  
23 May 1969

- 16) Number and grades of side slopes
- 17) Accumulated mileage
- 18) Duration of testing
- 19) Number of personnel required for towing

f. Record the following during each towing test:

- 1) Ambient temperature range
- 2) Wind conditions

g. Repeat the procedures of steps c through f for the remaining loaded test items.

h. Repeat the procedures of steps a through g for the following terrain surface conditions:

- 1) Hard or crusted ice and snow
- 2) Muskeg (on cross-country terrain)
- 3) Frozen soil with segregated ice
- 4) Heavy wet snow

#### 6.2.1.7 Unloading

At the completion of each towing test unload the test item and record the following:

- a. Number of personnel required for unloading
- b. Time required for unloading of the test item
- c. Damage to cargo caused by unloading
- d. Damage to the test item caused by unloading
- e. Material handling equipment utilized, as applicable
- f. Difficulties encountered

#### 6.2.1.8 Stowage

Determine the stowage capabilities of the test item as described in the applicable sections of MTP 2-3-508.

#### 6.2.2 Durability

Inspect the test item during the course of testing and record, as applicable, any evidence of, probable cause, and accumulated mileage or exposure time for the following:

- a. Premature rusting, corrosion, paint wear, etc.
- b. Damaged, loose, or missing hardware, including towing and hitching devices, and cargo and tarpaulin securing means.
- c. Damaged or worn structural parts, including runners
- d. Damaged or worn tarpaulin covers

#### 6.2.3 Transportability



#### 6.2.3.1 Packaging

TOE type units or personnel having the appropriate airborne MOS shall perform packing, packaging and marking for air shipment and rigging for air drop as follows:

a. Perform for each test item, the packaging, packing and marking operations described in the applicable test item technical manual or if packaging or packing instructions are unavailable, two test items of each type, free from defects, with associated equipment and fastening devices, shall be packed in an open wooden crate, Style B, Type I, IV or V of PPP-C-650, and packaged according to the following methods from MIL-P-116, Preservation Methods of:

- 1) For domestic shipment: Method 111
- 2) For overseas shipment: Method 1 A-2

b. Record the organization/unit being simulated.

c. Prepare a minimum of ten shipment containers as follows:

- 1) Two containers for domestic shipment
- 2) Two containers for overseas marine shipment
- 3) Four containers for air transport
- 4) Two containers for air drop

d. Mark each container as specified by MIL-STD-129.

e. Check and record, for each shipment container, conformance to or deviations from the following:

- 1) Packing and packaging requirements of step a
- 2) Marking requirements of MIL-STD-129

f. Determine and record the following for each container:

- 1) Test item nomenclature.
- 2) Test item identification number.
- 3) Linear dimensions of:
  - a) Length
  - b) Width
  - c) Height
- 4) Weight.
- 5) Cubage.
- 6) Time requirements to complete the packaging, packing and marking requirements.

#### 6.2.3.2 Surface Transportability

a. Subject the containers packed for domestic shipment and overseas shipment, during the conduct of paragraph 6.2.3.1, to the applicable

MTP 2-3-065  
23 May 1969

procedures of MTP 2-3-519 and the following, at the discretion of the Test Director:

- 1) For containers packed for domestic shipment:
  - a) Minimum of 50 miles of railroad travel
  - b) Minimum of 50 miles of motor vehicle travel
- 2) For containers packed for overseas marine shipment: a minimum of 20 hours of marine vessel travel.

b. Visually inspect the test items and their containers, at the completion of the respective transportability tests and record the following for each container:

- 1) Method of transportation.
- 2) Mileage of transportation or hours of water travel, as applicable.
- 3) Damage incurred by test item and containers.

#### 6.2.3.3 Air Transportability

- NOTES:
1. The conduct of air transportability testing shall be the responsibility of the appropriate test activity.
  2. Background information on air transport operations are contained in MTP 7-1-002.

6.2.3.3.1 Internal Transport - Perform the following, at the discretion of the test director:

a. Subject a minimum of two test item containers packed for air transport, during the conduct of paragraph 6.2.3.1, to the applicable procedures of MTP 7-3-515.

b. Subject the containers and test items to the procedures of paragraph 6.2.3.b, at the completion of the internal transport operations.

6.2.3.3.2 External Transport - Perform the following, at the discretion of the test director:

a. Subject a minimum of two test item containers, packed for air transport operations, during the conduct of paragraph 6.2.3.1, to the applicable procedures of MTP 7-3-516.

b. Subject the containers and test items to the procedures of paragraph 6.2.3.2.b, at the completion of air drop operations.

#### 6.2.4 Camouflage Operations

a. Camouflage a minimum of four test items according to the following:

- 1) Unloaded, nested together and covered by the protective covering, as applicable.

- 2) Located on an open expanse of level, snow-covered terrain, loaded, protectively covered, and hitched and ready for towing.
- 3) Located in other natural surroundings, loaded with protective covering over the cargo.

b. Record the following:

- 1) Ease of camouflaging operations
- 2) Time required for camouflage operations

c. Determine and record the distances at which the test item can be detected visually from ground positions, for each camouflage condition, in daylight and darkness, using:

- 1) Unaided eye
- 2) Optical instruments

d. Determine and record the maximum altitudes at which the test item can be detected visually from aerial observations, for each camouflage condition, in daylight and darkness, using:

- 1) Unaided eye
- 2) Optical instruments
- 3) Aerial photography

NOTE: Aerial observations shall be conducted with the cooperation of the cognizant test activity.

#### 6.2.5 Maintainability and Reliability Evaluation

Evaluate the maintenance-related factors of the test item as described in MTP 10-3-504 with emphasis on the following:

- a. Organizational (O), Direct Support (F), and General Support (H) maintenance requirements.
- b. Operator through General Support Maintenance Literature.
- c. Repair parts.
- d. Tools.
- e. Test and handling equipment.
- f. Calibration and maintenance facilities.
- g. Personnel skill requirements.
- h. Maintainability.
- i. Reliability.
- j. Availability.

#### 6.2.6 Human Factors Evaluation

- a. Determine the suitability of the test item design with respect to the man-equipment relationship as described in the applicable sections of MTP 2-3-516.
- b. Determine and record the suitability and the compatibility of the

MTP 2-3-065  
23 May 1969

test item with service personnel who use and maintain it, with respect to their skills, aptitudes, and physical limitations including the following as applicable:

- 1) Restrictions to test personnel during cargo loading/unloading operations.
- 2) Hindrance to use and maintenance of the test item because of protective clothing.
- 3) Comfort of the towing harness during manual towing operations.
- 4) Adequacy of the technical literature furnished with the test item.

#### 6.2.7 Safety

a. Determine the test item safety hazards resulting from operation, maintenance, and transport as described by the applicable sections of MTP 2-3-501.

b. Observe and record the adequacy of prescribed safety precautions throughout the period of testing and record any suggestions to improve these precautions.

c. Record the presence of the following hazardous features of the test item and its ancillary equipment.

- 1) Inherent design features in the test item and/or towing attachments.
- 2) Tendency for sled overturning, especially on turns or side slope operations.
- 3) Tendency for sled runaway on slippery down grades.
- 4) Tendency for sled towing vehicle jack-knifing.
- 5) Difficulty encountered by towing personnel in shedding their towing harness in the event of sled overturning or downhill runaway.

NOTE: 1. Safety hazards shall be reported to testing officers as soon as possible and test operations shall cease until the situation has been remedied by taking the appropriate action.

2. Determine whether the test item and the towing vehicle are capable of safe performance by service personnel of average skill and training. Record any special need for caution or additional safety measures.

d. Record the presence of required caution or warning notes attached to the towing vehicle, as appropriate.

e. Complete a safety confirmation in accordance with USATECOM Regulation 385-7.

#### 6.2.8 Value Analysis

During the conduct of the procedures of paragraphs 6.2.1 through 6.2.7 determine and record any test item features which could be eliminated without compromising its performance, durability, reliability, maintainability, or safety, in accordance with the criteria of USATECOM Regulation 700-1.

6.3 TEST DATA

6.3.1 Preparation For Test

6.3.1.1 Initial Inspection

6.3.1.1.1 Arrival Inspection -

a. Record data, collected as described in the applicable sections of MTP 2-3-500

b. Record the following for the test item packaging:

- 1) Evidence of damage or deterioration
- 2) Identification marking including:
  - a) Manufacturer
  - b) Contract number and date
  - c) Date of manufacture

3) The condition of item (new, unused, used)

c. Record the following for each shipping package:

- 1) Contents
- 2) Weight in pounds
- 3) Length, width and height in inches
- 4) Cubage in cubic feet

d. Record the adequacy of packing material in the shipping container.

e. Record the following for each test item, whenever applicable:

- 1) Evidence of defects in manufacture.
- 2) Evidence of defects in materials.
- 3) Evidence of defects in the test item which could endanger the safety of test personnel.

f. Record any discrepancies in test item marking deviations from MIL-STD-129.

g. Record the presence of instruction plates, if applicable, including:

- 1) Identification
- 2) Caution
- 3) Service and handling

6.3.1.1.2 Inventory Check -

Record all discrepancies in the inventory of:

- a. Maintenance instructions
- b. Spare parts
- c. Associated tools

MTP 2-3-065  
23 May 1969

- d. Associated equipment
- e. Components

#### 6.3.1.1.3 Physical Characteristics -

Record the data, collected as described in the applicable sections of MTP 2-3-500 and the following as applicable, for each test item:

- a. Weight in pounds
- b. Overall length in feet
- c. Overall width in feet
- d. Overall height in feet
- e. Cubage in cubic feet
- f. Dimensions of the cargo space in inches
- g. Dimensions of the sliding surfaces in inches
- h. Distances between sliding surfaces in inches
- i. Location(s) of towing bar or harness attachment points

#### 6.3.1.2 Operator Training and Familiarization

Record the following:

- a. Data collected as described in the applicable sections of MTP 10-3-501
- b. Adequacy of manuals for training purposes.
- c. Difficulties encountered while training.

#### 6.3.2 Test Conduct

##### 6.3.2.1 Operational Performance

##### 6.3.2.1.1 Test Item Assembly -

Record the following for each test item:

- a. Number of personnel required for assembly
- b. Time required for assembly in minutes
- c. Difficulties encountered during assembly
- d. Adequacy of assembly instructions
- e. Nomenclature
- f. Identification number

##### 6.3.2.1.2 Cargo Loading Adaptability -

Record the data, collected as described in the applicable sections of MTP 2-3-526, if required.

##### 6.3.2.1.3 Cargo Loading -

Record the following for each test item loaded:

- a. Nomenclature
- b. Identification number
- c. Number of personnel required for loading
- d. Time required for loading the test item, in minutes
- e. Material handling equipment used, as applicable
- f. Weight of cargo loaded, in pounds
- g. Adequacy of cargo space
- h. Adequacy of securing devices
- i. Ease of loading and securing cargo
- j. Difficulties encountered
- k. Damage to test item as caused by loading
- l. Damage to cargo caused by loading

6.3.2.1.4 Cargo Protection -

- a. Record the following for each test item, as applicable:

- 1) Duration of exposure in hours
- 2) Average wind speed during exposure in mph
- 3) Damage to protective cover
- 4) Damage to cargo
- 5) Cargo identity
- 6) Nomenclature
- 7) Identification number

- b. Retain all photographs

6.3.2.1.5 Vehicular Towing Tests -

Record the following for each towing test, as applicable:

- a. Type of hitch (drawbar, rope).
- b. Number of sleds (1, 3).
- c. Number of personnel required to attach the test item to the towing vehicle.
- d. Time required for the coupling operation in minutes.
- e. Difficulties encountered during the coupling operation.
- f. For each sled:
  - 1) Nomenclature
  - 2) Identification number
  - 3) Cargo identity
  - 4) Cargo weight in pounds
  - 5) Damage to test item
  - 6) Damage to cargo
- g. Turning and tracking ability.
- h. Ability to ride over vertical obstacles.
- i. Backing ability.
- j. Side slipping or swerving.
- k. Excessive rocking/rolling.
- l. Submersion of the leading edge of sliding surface or prow.

MTP 2-3-065  
23 May 1969

- m. Overturning tendency.
- n. Whipping tendency.
- o. Jackknifing tendency.
- p. Leaks, wear, or punctures of the cargo hull or body.
- q. Wear or fractures of runners.
- r. Tendency of the test item to draw towards or into the towing vehicle track.
- s. Minimum turning radius at each speed on:
  - 1) Roads (main or secondary)
  - 2) Cross-country terrain
- t. Duration of testing in hours.
- u. Terrain surface description (deep snow, hard or crusted ice and snow, etc.).
- v. Ambient temperature range in degrees F.
- w. Wind conditions (light, high, gusty, etc.).
- x. Organization/unit being simulated.

#### 6.3.2.1.6 Manual Towing Tests -

- a. Record the following for each test item, as applicable:
  - 1) Number of personnel required to attach the towing harness to the test item.
  - 2) Time required to attach the harness to the test item.
  - 3) Difficulties encountered during harness attachment.
  - 4) Type of harness (single, double trace).
- b. Record the following for each towing harness:
  - 1) Ease of donning the harness
  - 2) Adjustments required for proper fit.
  - 3) Time required to don the harness and make the adjustments.
  - 4) Personnel comments regarding the comfort of the harness and its fit with respect to protective clothing.
- c. Record the following for each test item during the course of towing operations, as applicable:
  - 1) Towing and tracking ability
  - 2) Ability to ride over vertical obstacles
  - 3) Side slipping or swerving
  - 4) Excessive rocking/rolling
  - 5) Submersion of the leading edge of sliding surface or prow
  - 6) Overturning tendency
  - 7) Leaks, wear or punctures of the cargo hull or body
  - 8) Wear or fractures of runners
  - 9) Damage to test item
  - 10) Damage to cargo
  - 11) Cargo identity



- 12) Cargo weight in pounds
- 13) Any difficulty encountered during towing
- 14) Nomenclature
- 15) Identification number
- 16) Number of right and left-hand turns negotiated
- 17) Number and grades of ascending and descending slopes
- 18) Number and grades of side slopes
- 19) Accumulated mileage
- 20) Duration of testing in hours
- 21) Number of personnel required for towing

d. Record the following during each towing test:

- 1) Terrain surface description (deep snow, hard or crusted ice and snow, etc.).
- 2) Ambient temperature range in degrees F.
- 3) Wind conditions (light, high, gusty, etc.).

#### 6.3.2.1.7 Unloading -

Record the following at the completion of each towing test:

- a. Number of personnel required for unloading
- b. Time required to unload the test item in minutes
- c. Damage to test item caused by unloading
- d. Damage to cargo caused by unloading
- e. Material handling equipment utilized, as applicable
- f. Difficulties encountered

#### 6.3.2.1.8 Stowage -

Record the stowage data, collected as described in the applicable sections of MTP 2-3-508.

#### 6.3.2.2 Durability

Record any evidence of, probable cause for, and accumulated mileage or exposure time for:

- a. Premature rusting, corrosion, paint wear, etc.
- b. Damaged, loose or missing hardware (towing and hitching devices, cargo and tarpaulin, securing means, etc.).
- c. Damaged or worn structural parts (runners, etc.).
- d. Damaged or worn tarpaulin covers.

#### 6.3.2.3 Transportability

##### 6.3.2.3.1 Packaging for Transport -

- a. Record any deviations from the specified packaging, packing and marking instructions of that outlined in paragraph 6.2.3. step a.
- b. Record the organization/unit being simulated.

MTP 2-3-065  
23 May 1969

c. Record the following for each packaged shipment container:

- 1) Test item nomenclature.
- 2) Test item identification number.
- 3) Linear dimensions of:
  - a) Length in inches
  - b) Width in inches
  - c) Height in inches
- 4) Weight in pounds.
- 5) Cubage in cubic feet.
- 6) Time required to complete the packaging, packing and marking requirements in minutes.

6.3.2.3.2 Surface Transportability -

- a. Record data, collected as described in the applicable sections of MTP 2-3-519.
- b. Record the following for containers packed for domestic shipment:
  - 1) Accumulated railroad travel in miles
  - 2) Accumulated motor vehicle travel in miles
- c. Record the total time of marine vessel travel, in hours, for containers packed for overseas marine shipment.
- d. Record damage incurred during transport.

6.3.2.3.3 Air Transportability -

Record the following for each container:

- a. For internal air transport operation:
  - 1) Data, collected as described in the applicable sections of MTP 7-3-515.
  - 2) Damage incurred during transport.
- b. For external air transport operation:
  - 1) Data, collected as described in the applicable sections of MTP 7-3-516.
  - 2) Damage incurred during transport.

6.3.2.3.4 Air Drop Capability -

Record the following for each container:

- a. Data, collected as described in the applicable sections of MTP 7-3-512.
- b. Damage incurred during air drop.

#### 6.3.2.4 Camouflage Operations

Record the following for each camouflage operation:

- a. Camouflage condition (nested together, open expanse, etc.)
- b. Ease of camouflage operations
- c. Terrain condition
- d. Time required for camouflage operations in minutes
- e. Detectability data from ground positions, including:
  - 1) Lighting conditions (daylight, darkness)
  - 2) Distances at which the test item(s) can be detected by unaided eye.
  - 3) Distance at which the test item(s) can be detected, using optical instruments.
- f. Detectability data, from aerial surveillance, including:
  - 1) Lighting condition (daylight, darkness)
  - 2) Maximum altitude at which the test item(s) can be detected by unaided eye.
  - 3) Maximum altitude at which the test item(s) can be detected, using optical instruments.
  - 4) Maximum altitude at which the test item(s) can be detected, using aerial photography.
- g. Test item nomenclature
- h. Test item identification number

#### 6.3.2.5 Maintenance Evaluation

Record maintainability and reliability data, collected as described in the applicable sections of MTP 10-3-504.

#### 6.3.2.6 Human Factors Evaluation

- a. Record data, collected as described in the applicable sections of MTP 2-3-516.
- b. Record the suitability and the compatibility of the test item with service personnel including the following, as applicable.
  - 1) Restrictions to test personnel during cargo loading/unloading operations.
  - 2) Hindrance to use and maintenance of the test item because of protective clothing.
  - 3) Comfort of the towing harness during manual towing operations.
  - 4) Adequacy of technical literature furnished with the test item.

#### 6.3.2.7 Safety

Record the following:

MTP 2-3-065  
23 May 1969

- a. Safety data, collected as described in the applicable sections of MTP 2-3-501.
- b. Adequacy of prescribed safety precautions through the period of testing and suggestions to improve these precautions.
- c. Any hazards resulting from the following:
  - 1) Inherent test item and attachment design
  - 2) Tendency to overturn
  - 3) Tendency to runaway
  - 4) Tendency to jackknife
  - 5) Difficulty in shedding manual towing harness
- d. The presence of required caution or warning notes attached to the towing vehicle, as appropriate.

#### 6.4 DATA REDUCTION AND PRESENTATION

All data shall be summarized using tables and/or charts as applicable. The data shall be analyzed to determine the extent to which the test item and its maintenance package meet the requirements of the QMR, SDR and detail specifications.

Data obtained from the conduct of subtests described by other MTP's shall be presented as described in those MTP's.

Calculations, when required, shall be performed as specified by the applicable MTP and all photographs and illustrative material shall be suitably identified.

A Safety Confirmation, based on data collected in paragraph 6.3.2.7, shall be prepared in accordance with USATECOM Regulation 385-7.

Evaluations shall be made to show the degree of mission fulfillment of the test item and its suitability for Army use with regard to use of operation, mobility and cargo carrying capability.

MTP 2-3-065  
23 May 1969

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D		
Security Classification of title, body of abstract and indexing annotation must be entered when the overall report is classified.		
1. ORIGINATING ACTIVITY (Corporate author) US Army Test and Evaluation Command (USATECOM) Aberdeen Proving Ground, Maryland 21005		2a. REPORT SECURITY CLASSIFICATION Unclassified
		2b. GROUP -----
3. REPORT TITLE US Army Test and Evaluation Command Mater Test Procedure 2-3-065, Commodity Service Test Procedure - "Sleds"		
4. DESCRIPTIVE NOTES (Type of report and, inclusive dates) Final		
5. AUTHOR(S) (First name, middle initial, last name) -----		
6. REPORT DATE 23 May 1969	7a. TOTAL NO. OF PAGES 28	7b. NO. OF REFS 25
8a. CONTRACT OR GRANT NO. DA-18-001-AMC-1045(R)	9a. ORIGINATOR'S REPORT NUMBER(S) MTP 2-3-065	
b. PROJECT NO. AMCR 310-6		
c. 	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) -----	
d. 		
10. DISTRIBUTION STATEMENT This document is subject to special export controls and each transmittal to foreign governments or foreign nationals, -WITH THE EXCEPTION OF AUSTRALIA, CANADA, AND UNITED KINGDOM, -may be made only with prior approval of HQ,USATECOM.		
11. SUPPLEMENTARY NOTES -----	12. SPONSORING MILITARY ACTIVITY Headquarters US Army Test and Evaluation Command Aberdeen Proving Ground, Maryland 21005	
13. ABSTRACT This Army Service Test Procedure describes test methods and techniques to determine to what degree sleds, both vehicular and manually-towed, (a) perform the mission as described in Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR) and Military Characteristics (MC) and (b) the suitability of sleds and their maintenance packages for service use by the Army. ( )		

DD FORM 1473

1 NOV 65  
S/N 0101-807-6811

(PAGE 1)

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Security Classification

A-31408

23 May 1969

**Security Classification**

**DD FORM 1473 (BACK)**  
5/N 0101-807-6821

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